

#### § 960.4-2-4

processes operating within the geologic setting shall permit compliance with (1) the requirements specified in § 960.4-1 for radionuclide releases to the accessible environment and (2) the requirements set forth in 10 CFR 60.113 for radionuclide releases from the engineered-barrier system using reasonably available technology.

(b) *Favorable Conditions.* (1) A host rock that is sufficiently thick and laterally extensive to allow significant flexibility in selecting the depth, configuration, and location of the underground facility to ensure isolation.

(2) A host rock with a high thermal conductivity, a low coefficient of thermal expansion, or sufficient ductility to seal fractures induced by repository construction, operation, or closure or by interactions among the waste, host rock, ground water, and engineered components.

(c) *Potentially adverse conditions.* (1) Rock conditions that could require engineering measures beyond reasonably available technology for the construction, operation, and closure of the repository, if such measures are necessary to ensure waste containment or isolation.

(2) Potential for such phenomena as thermally induced fractures, the hydration or dehydration of mineral components, brine migration, or other physical, chemical, or radiation-related phenomena that could be expected to affect waste containment or isolation.

(3) A combination of geologic structure, geochemical and thermal properties, and hydrologic conditions in the host rock and surrounding units such that the heat generated by the waste could significantly decrease the isolation provided by the host rock as compared with pre-waste-emplacement conditions.

#### § 960.4-2-4 Climatic changes.

(a) *Qualifying condition.* The site shall be located where future climatic conditions will not be likely to lead to radionuclide releases greater than those allowable under the requirements specified in § 960.4-1. In predicting the likely future climatic conditions at a site, the DOE will consider the global, regional, and site climatic patterns during the

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Quaternary Period, considering the geomorphic evidence of the climatic conditions in the geologic setting.

(b) *Favorable conditions.* (1) A surface-water system such that expected climatic cycles over the next 100,000 years would not adversely affect waste isolation.

(2) A geologic setting in which climatic changes have had little effect on the hydrologic system throughout the Quaternary Period.

(c) *Potentially adverse conditions.* (1) Evidence that the water table could rise sufficiently over the next 10,000 years to saturate the underground facility in a previously unsaturated host rock.

(2) Evidence that climatic changes over the next 10,000 years could cause perturbations in the hydraulic gradient, the hydraulic conductivity, the effective porosity, or the ground-water flux through the host rock and the surrounding geohydrologic units, sufficient to significantly increase the transport of radionuclides to the accessible environment.

#### § 960.4-2-5 Erosion.

(a) *Qualifying condition.* The site shall allow the underground facility to be placed at a depth such that erosional processes acting upon the surface will not be likely to lead to radionuclide releases greater than those allowable under the requirements specified in § 960.4-1. In predicting the likelihood of potentially disruptive erosional processes, the DOE will consider the climatic, tectonic, and geomorphic evidence of rates and patterns of erosion in the geologic setting during the Quaternary Period.

(b) *Favorable conditions.* (1) Site conditions that permit the emplacement of waste at a depth of at least 300 meters below the directly overlying ground surface.

(2) A geologic setting where the nature and rates of the erosional processes that have been operating during the Quaternary Period are predicted to have less than one chance in 10,000 over the next 10,000 years of leading to releases of radionuclides to the accessible environment.

(3) Site conditions such that waste exhumation would not be expected to

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occur during the first one million years after repository closure.

(c) *Potentially adverse conditions.* (1) A geologic setting that shows evidence of extreme erosion during the Quaternary Period.

(2) A geologic setting where the nature and rates of geomorphic processes that have been operating during the Quaternary Period could, during the first 10,000 years after closure, adversely affect the ability of the geologic repository to isolate the waste.

(d) *Disqualifying condition.* The site shall be *disqualified* if site conditions do not allow all portions of the underground facility to be situated at least 200 meters below the directly overlying ground surface.

### § 960.4-2-6 Dissolution.

(a) *Qualifying condition.* The site shall be located such that any subsurface rock dissolution will not be likely to lead to radionuclide releases greater than those allowable under the requirements specified in § 960.4-1. In predicting the likelihood of dissolution within the geologic setting at a site, the DOE will consider the evidence of dissolution within that setting during the Quaternary Period, including the locations and characteristics of dissolution fronts or other dissolution features, if identified.

(b) *Favorable condition.* No evidence that the host rock within the site was subject to significant dissolution during the Quaternary Period.

(c) *Potentially adverse condition.* Evidence of dissolution within the geologic setting—such as breccia pipes, dissolution cavities, significant volumetric reduction of the host rock or surrounding strata, or any structural collapse—such that a hydraulic interconnection leading to a loss of waste isolation could occur.

(d) *Disqualifying condition.* The site shall be *disqualified* if it is likely that, during the first 10,000 years after closure, active dissolution, as predicted on the basis of the geologic record, would result in a loss of waste isolation.

### § 960.4-2-7 Tectonics.

(a) *Qualifying condition.* The site shall be located in a geologic setting where future tectonic processes or events will

not be likely to lead to radionuclide releases greater than those allowable under the requirements specified in § 960.4-1. In predicting the likelihood of potentially disruptive tectonic processes or events, the DOE will consider the structural, stratigraphic, geophysical, and seismic evidence for the nature and rates of tectonic processes and events in the geologic setting during the Quaternary Period.

(b) *Favorable condition.* The nature and rates of igneous activity and tectonic processes (such as uplift, subsidence, faulting, or folding), if any, operating within the geologic setting during the Quaternary Period would, if continued into the future, have less than one chance in 10,000 over the first 10,000 years after closure of leading to releases of radionuclides to the accessible environment.

(c) *Potentially adverse conditions.* (1) Evidence of active folding, faulting, diapirism, uplift, subsidence, or other tectonic processes or igneous activity within the geologic setting during the Quaternary Period.

(2) Historical earthquakes within the geologic setting of such magnitude and intensity that, if they recurred, could affect waste containment or isolation.

(3) Indications, based on correlations of earthquakes with tectonic processes and features, that either the frequency of occurrence or the magnitude of earthquakes within the geologic setting may increase.

(4) More-frequent occurrences of earthquakes or earthquakes of higher magnitude than are representative of the region in which the geologic setting is located.

(5) Potential for natural phenomena such as landslides, subsidence, or volcanic activity of such magnitudes that they could create large-scale surface-water impoundments that could change the regional ground-water flow system.

(6) Potential for tectonic deformations—such as uplift, subsidence, folding, or faulting—that could adversely affect the regional ground-water flow system.

(d) *Disqualifying condition.* A site shall be *disqualified* if, based on the geologic record during the Quaternary Period, the nature and rates of fault movement or other ground motion are